

ELECTRIC TOOTHBRUSH

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Background of the Invention

This application is a continuation of Application Serial No. 10/082,503, filed February 25, 2002, which is a continuation of 09/766,703, filed January 22, 2001, which is a continuation of Application Serial No. 09/382,745, filed August 25, 1999, now U.S. Patent No. 6,168,579 B1, which is a continuation-in-part of Application Serial No. 09/236,794, filed January 25, 1999, now U.S. Patent No. 6,189,693B1, which is a continuation-in-part of Application Serial No. 09/163,621, filed on September 30, 1998, now U.S. Patent No. 6,000,083, the substances of which are incorporated herein by reference.

The present invention relates generally to electric toothbrushes. More particularly, it relates to an improved battery powered toothbrush.

The benefits of brushing one's teeth using motorized toothbrushes are well known, and motorized movement in toothbrushes has been the subject of much recent innovation and design activity. Also, the commercial market has seen the introduction, over the last several years, of many different types of motorized toothbrushes. However, an examination of the available technology shows a tendency toward increasingly complex, expensive, and non-commercially feasible methods of achieving motorized motions in the bristles and heads of toothbrushes to aid in more effectively cleaning one's teeth.

The commercial marketplace has become divided into two price markets. On the higher priced end are some of these more complex motorized toothbrushes that provide various motions to the bristles and brush head. The lower end of the market has become the province of very simple motorized toothbrushes that only vibrate through the use of an offset weight attached to the motor shaft, and which provide very little true additional cleaning benefit with their use, since no vigorous motion is transmitted to the cleaning surface of the brush. The vibrations are also very uncomfortable to the hand and act as a disincentive to brush one's teeth for an adequate time.

5 Numerous electric toothbrushes have been developed over the years. Some known devices are shown in U.S. Patent No. 5,070,567; U.S. Patent No. 5,186,627; U.S. Patent No. 5,274,870; U.S. Patent No. 5,341,534; U.S. Patent No. 5,378,153; and U.S. Patent No. 5,732,433. The intention of the present invention is to provide a low cost, effective, ergonomically correct, motorized toothbrush wherein the brush includes both a moving
10 circular brush portion and a fixed brush portion. Accordingly it has been considered desirable to develop a new and improved electric toothbrush which would overcome the foregoing difficulties and others while providing better and more advantageous overall results.

15 Summary of the Invention

An electric toothbrush is provided. The electric toothbrush includes an elongate body having a handle portion, a head portion having a longitudinal axis, and an elongate intermediate portion disposed between the handle portion and the head portion. The head portion has a first end that is located at a position furthest from the handle portion and a
20 second end opposite the first end that is disposed adjacent the elongate intermediate portion. The head portion has moving bristles that are disposed in a moving portion that oscillates and a static portion that extends from adjacent the moving portion to the second end of the head portion. The moving portion is disposed at the first end of the head portion and the static portion has a plurality of static bristles arranged in plurality of tufts. A motor is disposed in
25 the handle portion and a shaft extends from the second end of the head portion to beyond the plurality of tufts of static bristles. The shaft is operatively connected to the motor and to the moving portion to cause the moving portion to oscillate about an axis approximately normal to the longitudinal axis of the head portion.

30 Brief Description of the Drawings

The invention may take physical form in certain parts and arrangements of parts, preferred embodiments of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof, and wherein:

FIG. 1 is a perspective view of the electric toothbrush in accordance with a first
35 preferred embodiment of the present invention;

FIG. 2 is a side elevational view of the electric toothbrush of **FIG. 1**;

5 **FIG. 3** is a bottom elevational view of the electric toothbrush of **FIG. 1**;
 FIG. 4 is a side elevational view in cross section of the electric toothbrush of **FIG. 1**;
 FIG. 5 is an exploded perspective view of the electric toothbrush of **FIG. 1**;
 FIG. 6 is an enlarged side elevational view in cross section of the motor and gear
 assembly of the electric toothbrush of **FIG. 1**;
 10 **FIG. 7** is an enlarged side elevational view in cross section of the head of the electric
 toothbrush of **FIG. 1**;
 FIG. 8 is a front and side elevational view of the electric toothbrush in packaging;
 FIG. 9 is a perspective view of the electric toothbrush in accordance with a second
 preferred embodiment of the present invention;
 15 **FIG. 10** is a side elevational view of the electric toothbrush of **FIG. 9**;
 FIG. 11 is a bottom elevational view of the electric toothbrush of **FIG. 9**.
 FIG. 12 is a perspective view of the electric toothbrush in accordance with a third
 preferred embodiment of the present invention.

20 **Detailed Description of the Preferred Embodiments**

Referring now to the drawings wherein the showings are for the purposes of illustrating
 the preferred embodiments of the invention only and not for purposes of limiting same, **FIG.**
1 shows an electric toothbrush **A** according to a first preferred embodiment of the present
 invention. The electric toothbrush can be used for personal hygiene such as brushing one's
 25 teeth and gums.

As shown in **FIG. 1**, the electric toothbrush includes an elongated body portion **10**,
 which has a first end **12** and a second end **14**. A head **16** is attached to the first end **12** and a
 handle **18** is attached to the second end **14**.

The head **16** has a more traditional larger brush head shape which permits the user to
 30 brush his teeth in the typical manner of an up and down fashion. As shown on **FIG. 2**, the
 length of the head **16**, dimension "X", can range from about .75 inches to about 1.75 inches.
 The thickness of the brush head, dimension "Y", can range from about .25 inches to about
 .50 inches. The design of the head **16** allows for inexpensive manufacture and assists in
 bringing effective motorized rotational toothbrushes within the financial reach of a large
 35 portion of the population.

5 Referring now to **FIG. 3**, the head **16** further includes a longitudinal axis **19**, a circular or moving portion or brush head **20** and a static portion or brush head **22**. The static portion **22** is located on opposite sides of the circular portion **20**. The circular portion **20** is located at the center of the brush head **16**. The circular portion **20** rotates, swivels, oscillates or reciprocates about an axis approximately normal to the longitudinal axis **19** of the brush head
 10 **16**. The circular portion **20** may rotate 360° or partially rotate or oscillate or reciprocate in a back and forth manner.

The circular portion **20** includes stiff bristles **24**. The static portion **22** includes soft bristles **26**. The stiff bristles **24** are slightly recessed with respect to the soft bristles **26**. The stiff bristles **24** aid in the deep cleaning and plaque removal process, while the stationary soft
 15 bristles **26** are softer so as to not damage the gums. The thickness of the bristles, dimension "Z", shown in **FIG. 2**, can range from about .25 inches to about .75 inches.

Referring again to **FIG. 3**, the elongated body portion **10** further includes an angled shaft **28**, located between the head **16** and the handle **18**. The angled shaft **28** provides an ergonomic benefit that has not been utilized on a motorized toothbrush. The angle is well
 20 known for its ergonomic benefit in permitting easier access into the back recesses of the mouth while still contacting the tooth surface.

As shown in **FIG. 4** and **FIG. 5**, the elongated body portion **10** further includes a hollow portion **30** which houses a motor **32**. The motor **32** has a longitudinal axis **34** in line with a longitudinal axis **36** of the elongated body portion **10**.

25 To provide power to the circular portion **20** to rotate or oscillate or reciprocate, the motor **32** powers a worm gear **40** and a pair of step gears **42, 43**. The motor **32** is operatively connected to the worm gear **40**. Step gear **42** is operatively connected to step gear **43** and the worm gear **40**.

As shown in **FIG. 4** and **FIG. 6**, the first step gear **42** permits the matching second step
 30 gear **43** to be offset with respect to the longitudinal axis **36** of the elongated body portion **10**.

As shown in **FIGS. 4, 6** and **7**, a shaft **44** is connected at a first end to the offset step gear **43** and at a second end to the circular portion **20**. The second step gear **43** is placed at a desired angle so that the shaft **44** itself can still be straight, thus losing no power or torque through the added function of a flexible shaft.

35 Referring again to **FIG. 5**, the motor **32** and gears **40, 42, 43** are housed with an upper housing **46** and a lower housing **48**.

5 Referring again to **FIG. 4**, a switch **50** is provided to control operation of the electric toothbrush and is operatively connected to the motor **32**. The switch **50** includes a molded actuator button **52** and a metal contact **54**. The switch **50** is manually depressed by pressing a molded actuator button **52** down, which then presses against a metal contact **54**, which completes the circuit and provides momentary operation of the toothbrush. The switch **50** also allows continuous operation through a ramp design, sliding the button **52** forward toward the head **16** to provide for continuous operation. Moving the button **52** forward, combined with a molded in ramp **58** in the metal contact **54**, causes the button **52** to move downward, pressing against the metal contact **54** and completing the circuit. The toothbrush then continuously operates until the button **52** is slid back into an off position toward the handle **18** and the button **52** disengages the metal contact **54**.

15 By combining these two functions in one switch **50**, the toothbrush can be packaged in packaging as shown in **FIG. 8** where the consumer can depress the button **52** through the packaging and see its operation while still inside the packaging, and then be able to operate it continuously once out of the package. **FIG. 8** illustrates one version of the button **52**. It should be noted that other sizes and shapes of buttons may be used.

20 Referring now to **FIGS. 4** and **5**, a battery **60** is provided within the hollow portion **30** of the elongated body portion **10**. A battery terminal or contact **62** is provided for the battery **60**. An AA battery can be used as is illustrated in **FIG. 4**. To install the battery **60** into the hollow portion **30**, a slidable snap-on cover **64** is depressed and slid off the end of the handle **18** to expose the hollow portion **30**. The battery **60** is inserted, then the cover **64** is slid back on to the housing and snapped into place. The terminal end of the battery **60** is then in contact with the metal contact **54**.

30 If desired, depressions or grip areas **70** and **72** can be molded into the upper and lower housings **46**, **48** as shown in **FIG. 4**. The depressions **70**, **72** are used to support a user's thumb and forefinger or other fingers to make using the electric toothbrush easier and more comfortable.

A second preferred embodiment of the electric toothbrush according to the present invention is shown in **FIG. 9**.

35 The electric toothbrush includes an elongated body portion **80**, which has a first end **82** and a second end **84**. A head **86** is attached to the first end **82** and a handle **88** is attached to the second end **84**.

5 Referring now to **FIG. 11**, the head **86** further includes a longitudinal axis **90**, a circular or moving portion or brush head **100**, a static portion or brush head **102**, a first end **104**, and a second end **106**. The first end **104** is located adjacent the first end **82** of the elongated body portion **80**. The second end **106** is located opposite the first end **104**. The circular portion **100** is preferably located at the second end **106** of the brush head **86**. The static portion **102** is preferably located at the first end **104** of the brush head **86** adjacent the circular portion **100**. However, it is to be appreciated that the circular portion **100** and the static portion **102** can be arranged in different orientations. The circular portion **100** rotates, swivels, oscillates or reciprocates about an axis approximately normal to the longitudinal axis **90** of the brush head **86**.

15 The second preferred embodiment also has a worm gear **40** and a pair of step gears **42**, **43** as shown in **FIGS. 4 and 6**. The motor **32** powers the worm gear **40** and the pair of step gears **42,43**. The step gear **42** permits the matching step gear **43** to be offset with respect to the longitudinal axis of the elongated body portion **80**.

As shown in **FIGS. 4, 6, and 7**, a shaft **44** is connected at a first end to the offset step gear **43** and at a second end to the circular portion **100**. The second step gear **43** is placed at a desired angle so that the shaft **44** can still be straight, thus losing no power or torque through the added function of a flexible shaft.

Referring again to **FIG. 9**, a switch **130** is provided to control operation of the electric toothbrush and is operatively connected to the motor **32**. The switch **130** includes a molded actuator button **132**. The switch **130** is manually depressed by pressing a molded actuator button **132** down, which then presses against a metal contact **54**, which completes the circuit and provides momentary operation of the toothbrush. The operation of the switch **130** is identical to that shown in **FIGS. 4 and 6** and as described for the first preferred embodiment.

The switch **130** also allows continuous operation through a ramp design, sliding the button **132** forward toward the head **86** to provide for continuous operation. The toothbrush then continuously operates until the button **132** is slid back into an off position toward the handle **88** and the button **132** disengages the metal contact **54**.

As shown in **FIGS. 4 and 5** for the first preferred embodiment, the second preferred embodiment also has a battery **60** with a battery terminal or contact **62** provided within the hollow portion **30** of the elongated body portion **80**. To install the battery **60** into the hollow portion **30**, a slidable snap-on cover **134** (shown in **FIGS. 9 - 11**) is depressed and slid off the

5 end of the handle **88** to expose the hollow portion **30**. The battery **60** is inserted, then the cover **134** is slid back on to the housing and snapped into place.

If desired, raised grip areas **136** can be molded into the lower housing **124** as shown in **FIG. 9** and **FIG. 11**. The raised portions **136** are used to support a user's thumb and forefinger or other fingers to make using the electric toothbrush easier and more comfortable.

10 Raised portion **140** may also be molded onto the snap-on cover **134** to aid in gripping the cover with one's thumb and removing the cover from the handle **88**.

The electric toothbrush of the second preferred embodiment can also be packaged in packaging as shown in **FIG. 8** as shown for the first preferred embodiment where the consumer can depress the button **132** through the packaging and see its operation while still inside the packaging, and then be able to operate it continuously once out of the packaging.

15 A third preferred embodiment of the present invention is shown in **FIG. 12**.

The electric toothbrush includes an elongated body portion **150**, which has a first end **152** and a second end **154**. A head **160** is attached to the first end **152** and a handle **162** is attached to the second end **154**.

20 The head **160** further includes a moving portion or brush head **164**, a static portion or brush head **166**, a first end **168**, and a second end **170**. As shown in **FIG. 12**, the moving portion **164** is located adjacent the second end **170**. The static portion **166** is shown located adjacent the first end **168**. However, it is to be appreciated that the moving portion **164** could be located adjacent the first end **168**, and the static portion **166** could be located adjacent the second end **170**. Furthermore, the moving portion **164** could be positioned in the center of the brush head with static portions **166** on opposite sides of the moving portion **164** similar to that shown in **FIG. 3**.

In accordance with this embodiment, the moving portion **164** oscillates about an axis approximately normal to a longitudinal axis **172** of the elongated body portion **150**.

30 The moving portion **164** can include stiff bristles **178**. The static portion **166** can include soft bristles **180** which are softer than the stiff bristles. The stiff bristles **178** may be slightly recessed with respect to the soft bristles **180**. The stiff bristles **178** aid in the deep cleaning and plaque removal process, while the stationary soft bristles **180** are softer so as to not damage the gums.

35 The elongated body portion **150** further includes an angled shaft **190**, an upper housing **192** (not shown), and a lower housing **194**. The angled shaft **190** is located between the head

5 **160** and the handle **162**. The angled shaft **190** provides an ergonomic benefit that has not been utilized on a motorized toothbrush.

10 The elongated body portion **150** of the third preferred embodiment also includes a hollow portion **196**, which houses a motor **200**. The hollow portion **196** is formed between the upper housing **192** and the lower housing **194**. The motor **200** provides power to the moving portion **164** to rotate or oscillate or reciprocate. Power is provided to the motor by battery as shown and described for the first embodiment.

15 A switch (not shown) can be provided which is similar to switch **130** shown in **FIGS. 9 and 11** and which functions as described for the first and second preferred embodiments. The third embodiment further includes a first gear **202** which is operatively connected to and powered by the motor **200**. The first gear **202** rotates about the longitudinal axis **172** of the elongated body portion **150**. A second gear **206** is operatively connected to the first gear **202**. The second gear **206** is approximately normal to the first gear **202**. The second gear **206** rotates about an axis approximately normal to the longitudinal axis **172**. Teeth **208** of the first gear **202** mesh with teeth **210** of the second gear **206**, thus causing second gear **206** to rotate when first gear **202** rotates.

20 A first swivel arm **220** is pivotably connected to the second gear **206** via a pin **222** or other fastening device. A second swivel arm **224** is pivotably connected to the first swivel arm **220** via a pin **226** or other fastening device. A shaft **230** is fixedly secured at a shaft first end **232** to the second swivel arm **224**. The shaft **230** is pivotably attached at a shaft second end **234** to a third swivel arm **240**. The shaft **230** is housed within the angled shaft **190**.

25 The shaft **230** is generally parallel with the longitudinal axis **172**.

30 A guide spacer **250** is located within the angled shaft **190** and surrounds the shaft **230** adjacent the first end **232** of the shaft **230** to minimize lateral movement of the shaft **230**. A second guide spacer **252** is located adjacent the second end **234** of the shaft **230** to also minimize lateral movement of the shaft **230**. Guide spacers **250, 252** align the shaft **230** within the angled shaft **190** and minimize its movement from side to side within the angled shaft **190**.

35 The third swivel arm **240** has a first end **244** and a second end **246**. The third swivel arm **240** is pivotably connected to the second guide spacer **252** at the swivel arm first end **244** via a pin **253**. The third swivel arm **240** is connected at the swivel arm second end **246** to the

5 moving portion **164** via a pin **254** or other fastening device. The pin **254** is connected to a disk **256** of the moving portion **164**, which is housed within the head **160**.

As the first gear **202** rotates, the second gear **206** is rotated, thus moving the first swivel arm **220** in a back and forth circular fashion about the second gear **206** and along the longitudinal axis **172**. The first swivel arm **220** also can pivot about the pin **222**. The first
 10 swivel arm **220** retains its orientation of approximately parallel to the longitudinal axis **172** of the elongated body portion **150** during movement. The second swivel arm **224** pivots with respect to its pin connection **226** with the first swivel arm **220** thus allowing the shaft **230** to oscillate in a back and forth manner toward and away from the brush head with minimal lateral motion.

15 During operation, the third swivel arm **240** moves back and forth along the longitudinal axis **172** of the elongated body portion **150** along with the shaft **230**.

The swivel arm **240** can also pivot or move slightly laterally in a direction perpendicular to the longitudinal axis.

The third swivel arm **240** has an offset arm **260** which is offset from the longitudinal
 20 axis **172** and moves the disk **256** of the moving portion **164** in a partially rotating or oscillating motion. As the third swivel arm **240** moves back and forth, the offset arm **260** moves along an outside edge **262** of the disk **256** in a partially rotating or oscillating fashion about an axis which is approximately normal to the longitudinal axis **172**. This causes the bristles **178** to also move in a partially rotating or oscillating manner about an axis
 25 approximately normal to the longitudinal axis **172**.

When the third swivel arm **240** rotates, the disk **256** also rotates about an axis approximately normal to the elongated body portion longitudinal axis **172**. The third, swivel arm **240** also retains its orientation of approximately parallel to the elongated body portion longitudinal axis **172** during movement.

30 If desired, raised grip areas (not shown) can be provided which are similar to raised grip areas **138** and **140** shown in **FIG. 9** and **FIG. 11** for the second preferred embodiment. The raised grip areas can be molded into the lower housing **194**.

The electric toothbrush of the third preferred embodiment can also be packaged in packaging as shown in **FIG. 8** as shown for the first preferred embodiment. The consumer
 35 can depress a button (not shown) similar to button **132** shown in **FIG. 9** and **FIG. 11** for the

5 second preferred embodiment through the packaging and see its operation while still inside the packaging, and then be able to operate it continuously once out of the packaging.

The invention has been described with reference to the preferred embodiments. Obviously, modifications and alterations will occur to others upon a reading and understanding of this specification. It is intended to include all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed is:

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